

SUPPORT FOR THE AMENDMENT

This Amendment cancels withdrawn Claims 22-39; and amends Claims 3-11. Support for the amendments is found in the specification and claims as originally filed. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1 and 3-21 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the personal interview on October 3, 2006. Applicants thank the Examiner for the indication during the interview that the prior art rejections will be withdrawn. Interview Summary dated October 3, 2006.

As discussed at the personal interview, there is a trend in the semiconductor industry towards replacing gates of doped polysilicon with metal gates. Candidate metal gates include Ni-containing materials. However, conventional plasma etching of Ni-containing materials using halogen-based chemistry is difficult. Specification at [0003]-[0005].

The present invention provides a method of plasma etching Ni-containing materials using a plasma formed from a carbonyl gas (e.g., CO, CO₂) and a hydrogen halide (HX).

Claims 1, 3-4, 7, 11, 13-15 and 18 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 4,723,903 ("Okazaki") in view of U.S. Patent No. 6,464,889 ("Lee"). In addition, Claims 5, 9, 16 and 20 are rejected under 35 U.S.C. §103(a) over Okazaki and Lee in view of the English language JPO abstract of JP 02-088782 ("Hitachi"). Claims 8 and 19 are rejected under 35 U.S.C. §103(a) over Okazaki and Lee in view of U.S. Patent No. 6,156,666

("Tokushima"). Claims 6, 10, 17 and 21 are rejected under 35 U.S.C. §103(a) over Okazaki, Lee and Hitachi in view of Tokushima.

Okazaki discloses a multilayered film comprising a Ti layer 26 on a Ni layer 25. Okazaki at abstract; Fig. 6. Okazaki discloses that the Ti layer 26 can be etched using a CF₄ plasma and that the Ni layer 25 can be etched using a CO plasma. Okazaki at column 4, lines 60-68.

Lee discloses that Ti can be etched with numerous combinations of halide gases (e.g., BCl₃, HCl, CF₄, NF₃, and/or SF₆) in a noble gas, such as helium or argon. Lee at column 6, line 67 to column 7, line 3.

However, there is no reasonable expectation that the skilled artisan would add the HCl used by Lee to etch Ti to the CO plasma used by Okazaki to etch Ni. Okazaki in view of Lee fails to suggest etching a nickel-containing layer with a mixture of a carbonyl gas and a hydrogen halide gas. In particular, Okazaki in view of Lee fails to suggest the independent Claim 1 limitations of "introducing a process gas, said process gas comprising a carbonyl gas and a hydrogen halide gas; forming plasma from said process gas; and etching said nickel-containing layer by exposing said nickel-containing layer to said plasma".

The secondary references, which are not applied against independent Claim 1, fail to remedy the deficiencies of Okazaki and Lee.

Thus, the prior art rejections should be withdrawn.

Claims 3-11 are objected to. To obviate the objection, Claims 3-11 are amended to depend from independent Claim 1.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

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